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Douglas-Fir Tussock Moth in the Western United States

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Importance

Outbreaks of the Douglas-fir tussock moth, *Orgyia pseudotsugata* (McDunnough), occur periodically in the Western United States. Usually persisting at low levels, moth populations begin to increase 4 to 6 years after an outbreak subsides. Historically, epidemics occur suddenly and, following a year or two of severe defoliation, subside abruptly.

Though of short duration, outbreaks have had devastating effects on infested stands. During the early stages of an infestation, single or small groups of trees — often in residential areas — are the first to show defoliation. Later, stands of up to several hundred acres in size may be infested. Ultimately, areas as large as several hundred thousand acres may be affected. Such was the case with the last major outbreak in the West in 1974.

*Fully developed larvae
on fir needles.*



Damage

Grand fir, Douglas-fir, subalpine fir, white fir, and spruce are the favorite hosts of the tussock moth. During outbreaks, less favored tree species and even understory shrubs may be fed upon.

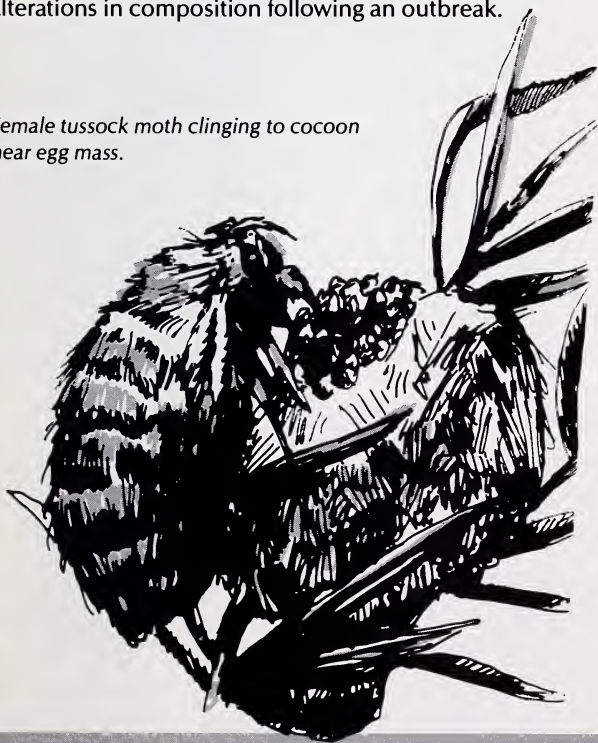
In early spring, young larvae (caterpillars) feed on the underside of new needles. This feeding causes the needles to shrivel and die. Later, older needles are eaten or severed near their base and left entwined in silken webbing.

Defoliated trees turn reddish brown by July. Tree tops and the outermost portions of branches are defoliated first. Some defoliated branches may be heavily webbed. In heavy infestations, trees may be completely stripped in a single year. Occasionally, a single year's feeding will kill a tree or produce a dead top. More commonly, major amounts of tree mortality occur after 2 or more successive years of feeding.

Once an outbreak subsides, those trees that survive may be so weakened that they create favorable habitat for other tree-killing insects and disease organisms. Even if they are not killed by these other pests, weakened trees may have reduced growth rates. Outbreaks can also damage seedlings and saplings.

Ultimately, stands in which tussock moth hosts constitute a major component may experience significant alterations in composition following an outbreak.

Female tussock moth clinging to cocoon near egg mass.



Description

Tussock moths get their name from the four dense, buff-colored "tussocks" of hair located along the middle of the back of mature larvae. When full grown, larvae are about 1¼ inches long and have two long, black tufts (or "pencils") of hair behind the head. A similar, but longer pencil is found on the posterior end. Shorter hairs cover the body and grow out of reddish wartlike tubercles. The body hairs may irritate the skin of some people, so care should be taken when handling the larvae. Mature larvae may vary from light to dark, but two main color variations are noticeable — a lighter "blond" and a darker "brunette."

The adult moths are very different in appearance. The male is an ordinary-looking moth ranging in color from gray brown to black brown. It has feathery antennae and a wingspan of 1 to 1¼ inches. The forewings are grayish brown with two indistinct dark bars and two vague whitish spots. The hindwings are a contrasting reddish brown.

A male tussock moth in flight.



The female, on the other hand, does not look like a moth at all. She is usually about three-fourths of an inch long and grayish in color, darker toward the tip of her abdomen. She has tiny, rudimentary wings, which render her completely incapable of flight. Her antennae are thin and threadlike. She rarely moves far from the cocoon from which she emerged. Once mated, she lays her eggs right on the cocoon. The egg mass may be an inch long and contain up to 250 eggs. The eggs are held into a mass by a frothy-looking substance that contains many of the hairs from the female's body.

Biology

Tussock moths overwinter in the egg stage. Eggs hatch from mid-May to early June. Emerging larvae are about one-eighth of an inch long, gray, with long body hairs. As they move about seeking tender, new foliage, they may be transported considerable distances by the wind.

The first three larval instars (a developmental stage distinguished by shedding of the skin) feed on the current-year needles, sometimes until the end of July. The last larval instar constructs a thin cocoon of silken webbing and body hairs in which to pupate.

The pupal or resting stage may extend from late July through August. During that time pupae may be found in various locations. When populations are low, most are found on the undersides of branches near the tip. During periods of high population, pupae may be located in large masses on foliage or trunks of host trees, on ground plants, or in protected locations on rocks, boards, or adjacent structures.

Moths usually emerge from cocoons in 10 to 18 days. Females, upon emerging, emit a strong attractant sex pheromone to attract the more mobile male. Having mated, the female lays her eggs, completing the yearly cycle. There is one generation each year.



A male tussock moth hangs from cocoon.

Natural Control

Many natural agents exist that keep tussock moth populations low most of the time. At low levels, over 90 percent of the larvae and 75 percent of the pupae and eggs are killed each year by natural factors. These include small wasps that parasitize the eggs and pupae, flies that parasitize the larval stage, and birds and other predators that destroy large numbers of larvae, pupae, and egg masses. Periodically, tussock moth populations escape these natural mortality factors in sufficient numbers to reach epidemic proportions. After a year or two of high populations, a naturally occurring nucleopolyhedrosis virus begins to increase rapidly. It is so effective at reducing populations that it is largely responsible for the rapid collapse of outbreaks.

Applied Control

Efforts to prevent tree damage from tussock moth outbreaks involve four major activities: early detection, evaluation, suppression, and prevention.

Early detection involves the use of pheromone-baited sticky traps, which help assess male populations and serve as an indicator of population levels the following year. Spring egg mass and larval surveys can also help determine population trends.

When detection efforts indicate populations are rising, evaluations of larval densities and stand conditions help determine potential impacts. Only then can decisions regarding the need for suppression be made.

Should suppression efforts be deemed necessary, materials are available which, when used in a timely manner, can reduce larval numbers and in so doing protect the threatened resource. At present, three chemical and two biological control agents are registered for tussock moth suppression. They are carbaryl, acephate, diflubenzuron, *Bacillus thuringiensis*, and the nucleopolyhedrosis virus. Each has attributes that might make it the material of choice under certain sets of conditions.

Prevention of outbreaks is the ultimate goal of pest management. Knowledge concerning the relationships between insect-host interactions and stand dynamics suggest that silvicultural systems may be able to reduce susceptibility of host stands. Host species growing on warm, dry sites or on sites not well suited to their vigorous growth are most susceptible. Available information indicates that stands that are healthy, thrifty, and growing on the proper site are less likely to sustain tussock moth outbreaks. They are also less vulnerable to permanent damage should outbreaks occur.

Credit: Illustrations by Matt Cooper

Precautions for use of pesticides

Pesticides used improperly can be injurious to humans, animals, and plants. Follow the directions and heed all precautions on the labels.

Store pesticides in original containers — out of reach of children and pets — and away from foodstuffs.

Apply pesticides selectively and carefully. Do not apply a pesticide when there is a danger of drift to other areas. Avoid prolonged inhalation of a pesticide spray or dust. When applying a pesticide it is advisable that you be fully clothed.

After handling a pesticide, do not eat, drink, or smoke until you have washed. In case a pesticide is swallowed or gets in the eyes, follow the first-aid treatment given on the label, and get prompt medical attention. If the pesticide is spilled on your skin or clothing, remove clothing immediately and wash skin thoroughly.

Dispose of empty pesticide containers by wrapping them in several layers of newspaper and placing them in your trash can.

NOTE: Registrations of pesticides are under constant review by the Federal Environmental Protection Agency. Use only pesticides that bear the EPA registration number and carry directions for home and garden use.



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Additional Information

For additional information regarding Douglas-fir tussock moth outbreaks, damage, or control, contact any of the following USDA Forest Service or State offices:

Northern Region

USDA Forest Service
Timber, Cooperative Forestry, and
Pest Management
P.O. Box 7669
Missoula, MT 59807

Insect and Disease Section
Idaho Department of Lands
P.O. Box 670
Coeur d'Alene, ID 83814

Forest Insect and Disease Section
Forestry Division
Montana Department of
State Lands
2705 Spurgin Road
Missoula, MT 59801

Rocky Mountain Region

USDA Forest Service
Timber, Forest Pest, and
Cooperative Forestry
Management
P.O. Box 25127
Lakewood, CO 80225

Colorado State Forest Service
Colorado State University
Fort Collins, CO 80523

Southwestern Region

USDA Forest Service
Forest Pest Management
517 Gold Avenue, SW
Albuquerque, NM 87102

New Mexico Department of
Agriculture
Bureau of Entomology and
Nursery Industries
P.O. Box 3189
Las Cruces, NM 88003

Arizona State Land Department
Forestry Division
1624 West Adams
Phoenix, AZ 85007

Intermountain Region

USDA Forest Service
Forest Pest Management
324 25th Street
Ogden, UT 84401

Utah Division of State Lands and
Forestry
3 Triad Center, Suite 400
355 West North Temple
Salt Lake City, UT 84180-1204

Insect and Disease Section
Idaho Department of Lands
P.O. Box 670
Coeur d'Alene, ID 83814

Pacific Southwest Region

USDA Forest Service
Forest Pest Management
630 Sansome Street
San Francisco, CA 94111

California Department of Forestry
and Fire Protection
Resources Building
1416 Ninth Street
Sacramento, CA 95814

Pacific Northwest Region

USDA Forest Service
Forest Pest Management
P.O. Box 3623
Portland, OR 97208

Oregon Department of Forestry
2600 State Street
Salem, OR 97310

Washington Department of
Natural Resources
202 Public Lands Building,
QW-21
Olympia, WA 98504

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